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EQUIPMENT AND TECHNIQUE USED IN LABORATORY STUDIES OF THE CITRUS RED MITE

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In studies with the citrus red mite (*Metatetranychus citri* (McG.)) at the Whittier, Calif., laboratory, purified air was found to be essential in rearing this mite (Munger 2, 3). Further work led to the development of special equipment and methods which are being used to study the biology of the mite under various conditions. For example, information is being obtained on egg production, length of life cycle, parthenogenesis, sex ratio, and mortality. The methods may also be used in laboratory tests of new acaricides.

Host Lemons

Mites thrive best on dark-green, slightly elongate lemons about 1 1/2 to 1 3/4 inches in diameter. Such lemons are available the year around, and the equipment has been designed to fit them.

When brought into the laboratory, the lemons are rolled in bentonite and brushed clean to remove mite eggs and active stages,[1] and those to be used for mite supply are dipped in hot paraffin at each end to a depth of 1/2 inch. The paraffin slows down shrinkage, provides a relatively mite-free area which prevents mites from being crushed when the lemons are picked up, and traps predators under the sepals. The DDT treatment of the sepals, prescribed in earlier work (Munger 2), is now unnecessary, because the lemons are usually discarded before they have shrunk enough to cause the paraffin to crack and release the predators.

Ten lemons make a convenient supply unit. A flat rack for holding them evenly spaced consists of a piece of 1/2-inch plywood 6 x 13 inches with thirty 1 1/2-inch finishing nails driven into it so that each lemon is supported on the heads of three nails (figure 1).

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[1] Cleaning method devised by H. R. Yust, formerly of the Whittier, Calif., laboratory.

Methods of Infesting Lemons

Two methods of infesting the lemons are used. In one method source lemons heavily infested with young mature mites are placed in a circular wooden container 6 1/2 inches in diameter with a flexible paper rim 2 inches high, and lemons to be infested are placed on top with as many as possible leaning against the top edge of the rim. As the mites migrate, many of them crawl to the edge of the rim and find their way to the lemons. Other mites crawl directly from lemon to lemon. The newly infested lemons are removed when they have approximately eight mites each.

The other method is manual and gives absolute control of the number and kind of mites transferred. Observations on the reactions of the mites led to the adoption of a plastic knitting needle 3/16 inch in diameter and 9 inches long as a transfer tool. The tool should be of a contrasting color, preferably yellow, and of a material that will not acquire an electric charge, as this will hamper the transfer. A supply lemon bearing recently emerged mature female mites is held in the left hand under a magnification of 9-10 X. With the needle in the right hand, one end is placed on the lemon near the far side of a selected mite and brought slowly toward the mite. A slight clockwise revolving motion as the tool approaches and touches the mite will cause it to grasp the tool. The tool is then placed on the fresh lemon and moved away from the operator. A counterclockwise rotation as the mite touches the lemon will cause it to take hold of the lemon and leave the tool. A number of mites may be collected on the tool before being transferred. Eight mites are usually transferred to each lemon. A close-woven cloth wrapper supported by a four-legged wooden frame on the rack is used to prevent the mites from crawling about the rearing compartment and getting onto other lemons.

The rearing room (with a carbon filter) is held at 75° F. and 65 percent relative humidity. The life cycle of the mites in this room is approximately 2 weeks. About 15-16 days after the transfer a supply of newly emerged females is available. Recent emergence of individual mites can be insured by removing all mature females the day before making a transfer.

Lemon Cage

A lemon cage (figure 2) is used in studying the activities of mites in confinement. It is similar to the leaf cage used in rearing the citrus thrips (Munger 1), but it utilizes a lemon instead of a leaf for food. A piece of double-strength window glass 3 x 5 inches with a beveled oval hole 1 1/4 x 1 9/16 inches cut in the middle, the long way of the glass, is prepared. The greenest side of a lemon is placed on the nonbeveled side of the glass and sealed in place on both sides of the glass by means of crude beeswax heated to approximately 345° F. The cover of the cage is a piece of 1/4-inch plate glass 3 x 5 inches with a hole 1 7/8 inch in diameter drilled through the center. The hole is covered with a piece of silk stencil cloth, having 150 threads per inch, fastened with clear brushing lacquer. The glass cover is fastened to the window glass with two pieces of adhesive cellophane tape, which act as hinges on one side of the cage.

Immediately upon being sealed, the glass, with the lemon lowermost, is placed on a cup of light-weight galvanized iron (or other suitable nonrusting metal such as zinc or stainless steel) 2 inches tall, 2 3/4 inches wide, and 3 3/4 inches long, oval-shaped, holding sufficient water to wet the underside of the glass. The water keeps the lemon turgid and, by capillary action, separates the wax from the glass but not from the lemon. Thus, any shrinkage of the lemon does not allow crevices where mites could hide, it merely causes the lemon and the wax to sink deeper into the beveled hole. Under high temperatures the weight of the lemon will sometimes cause it to break away from the glass. This can be prevented by placing paper toweling in the bottom of the cup to relieve some of the weight.

Lemon cages are conveniently handled in groups of five on 1/4-inch plywood boards 5 x 18 inches. Observations are best made under a binocular microscope with a magnification of 9-10 X. During inspection the cage is placed on a small wooden holder (figure 3), which allows the cover to be turned back and rest in a horizontal position, exposing the lemon surface to view.

Obtaining Eggs in Cage

In order to obtain eggs, a special cover is used. This cover consists of three parts: (1) a piece of 1/4-inch plate glass 3 x 5 inches with a 1 7/8-inch hole drilled through the middle; (2) a piece of double-strength window glass 3 x 4 1/2 inches with two holes, both on the center line, one 1 inch in diameter with the center 1 5/8 inches from one end, covered with stencil cloth for ventilation, and the other 1/4 inch in diameter and the center 2 5/8 inches from the same end, left open; (3) a microscope slide over the open hole.

A female mite is placed on the slide with the transfer tool. The slide is then inverted, and the mite placed within the area circumscribed by the open hole. By the time another mite has been transferred to the top side of the slide, the first one will usually have moved to the inside of the cover, from which it eventually finds its way to the lemon; if not, slight stimulation will hasten the mite. In this way any desired number of mites can be transferred to the cage in a short time. When the desired ovipositing time has elapsed, or the required number of eggs has been obtained, the females are removed with a small brush and the special cover is replaced by the standard cover.

Distribution of Mites

Sometimes it is desirable to distribute mites from a number of supply lemons evenly over groups of lemons that are to receive, for example, different spray treatments. A turntable, 18 inches in diameter, made of 1/2-inch plywood was constructed for this purpose, with finishing nails in groups of three inserted near the periphery of the table to hold 20 lemons. After a mite has been placed on the first lemon, the table is rotated to bring the next lemon into position. At the end of one revolution each lemon has received a mite. The process is continued until the desired number of mites have been transferred to each lemon.

Literature Cited

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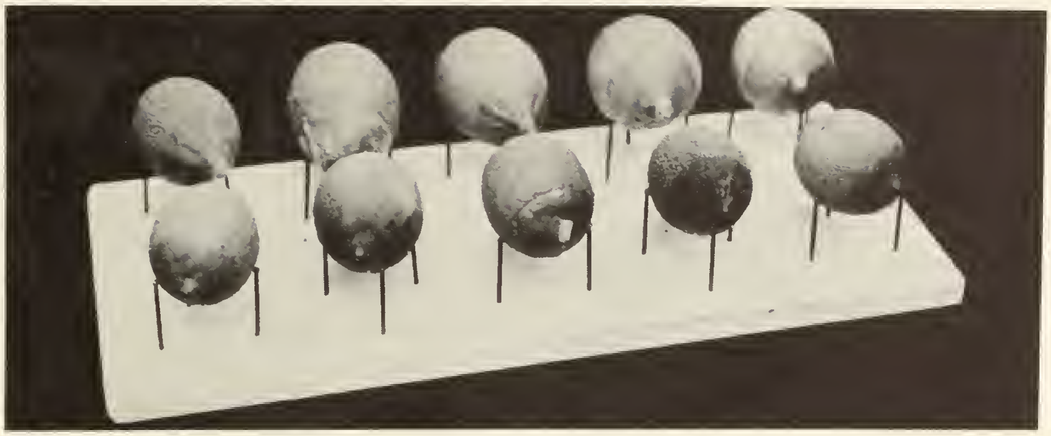

Figure 1.--Supply unit for rearing mites on lemons.

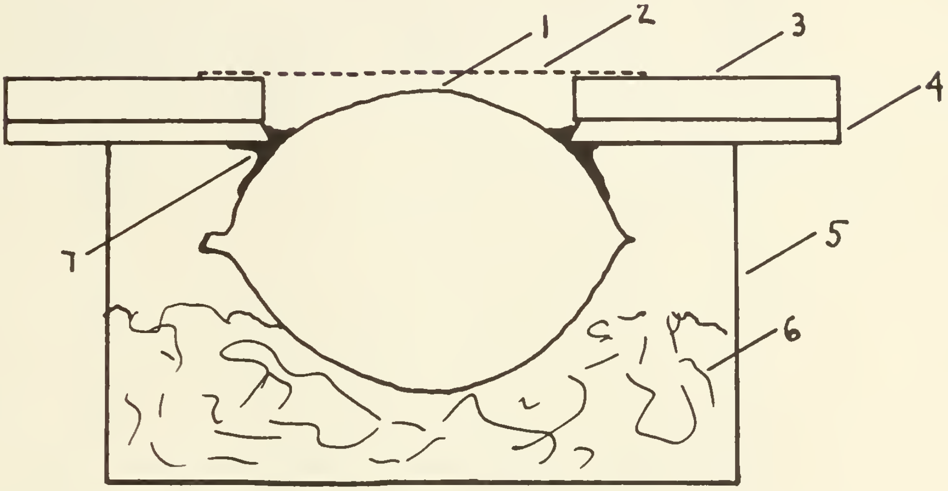

Figure 2.--Diagram of parts of lemon cage, side view.

(1) Lemon, feeding area
(2) Porous silk stencil cloth
(3) Plate-glass cover
(4) Window glass to which lemon is fastened
(5) Metal cup filled with water
(6) Paper toweling to support lemon
(7) Beeswax fastening lemon to glass

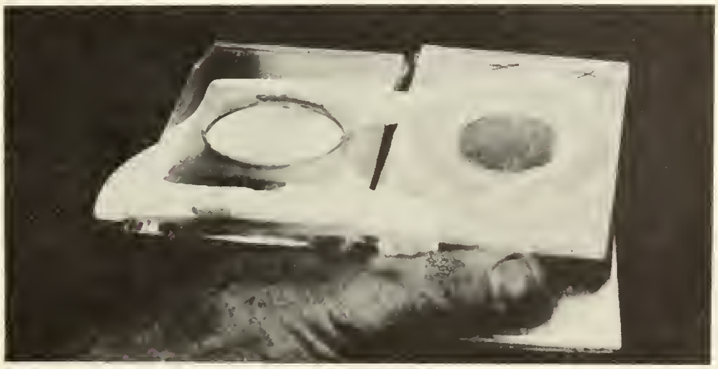

Figure 3.--Lemon cage open for inspection on a wooden holder.